High statistics varistor tests

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Two measurements:

1) Clamping voltage → seems straight forward

2) Varistor resistance → some more thoughts on the next two slides

What we would like to know:

How much does the addition of varistors change the total resistance between the field cage tubes?

Lets say we allow a change of

$R_{tot}' = x * R_{tot}$,

with x (fractional change) to be specified

$$R_V > \frac{\frac{250\ M\Omega}{N}}{1/x - 1}$$

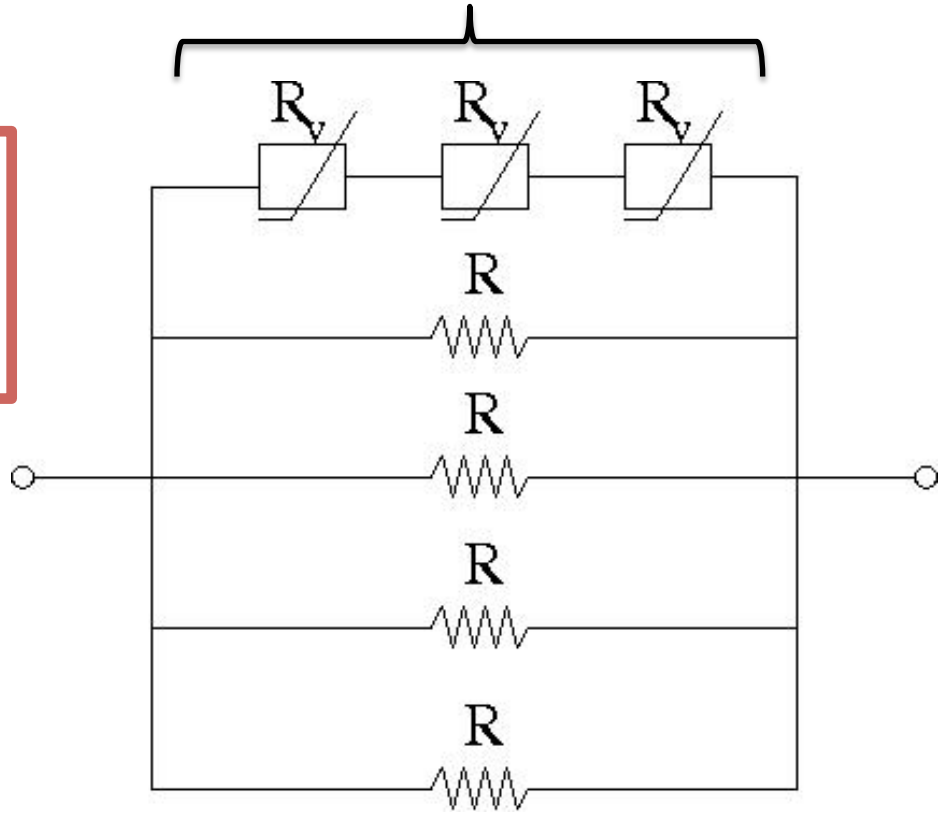
Let's say we allow 1% change -> x = 0.99

$R_V > 25\ G\Omega / N$

Let's say we allow 0.1% change -> x = 0.999

$R_V > 250\ G\Omega / N$

Setup in the field cage:
N varistors in series

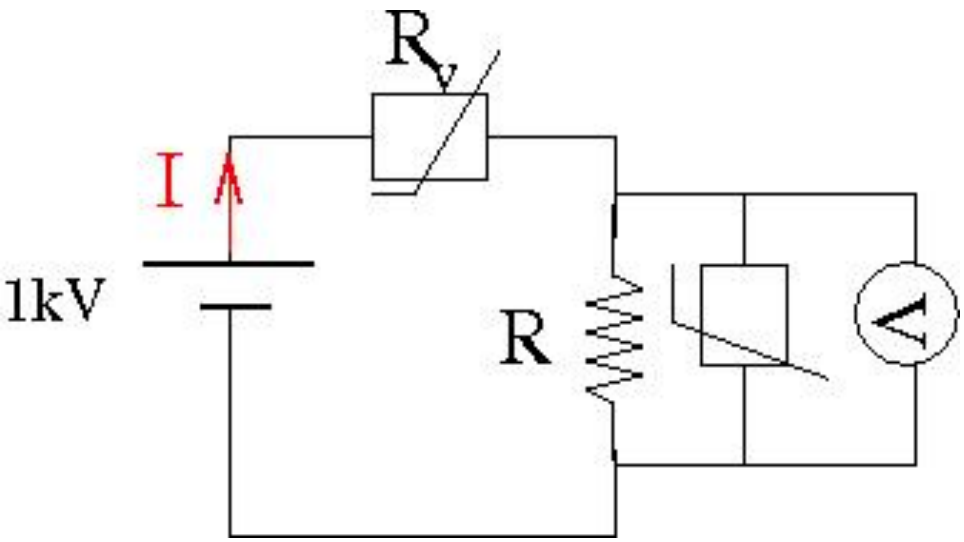


Our test setup:

We measure the voltage V across the 1MΩ resistor:

$$V = \frac{1\ \text{kV} * 1\ \text{MΩ}}{(R_V + 1\ \text{MΩ})}$$

This voltage is really small (for R_V = 10 TΩ -> V = 0.1 mV)



We will try to measure the resistance. If not possible (fluctuating a lot!) we will classify in categories:

Category 1: V < 1 mV
R_V > 1 TΩ
x > 0.9998

Category 2: V < 10 mV
R_V > 100 GΩ
x > 0.998

Category 3: everything else